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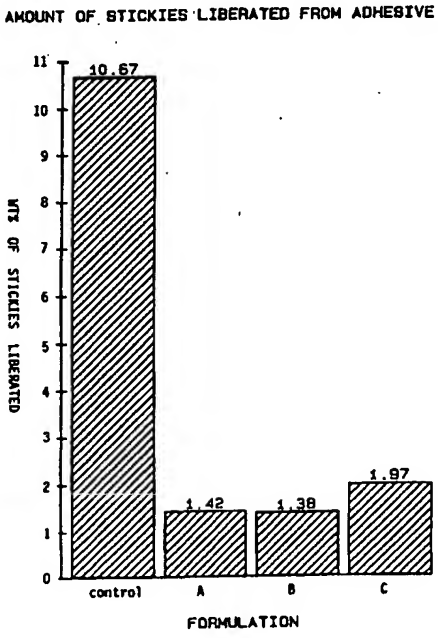
(54) Prevention of stickies in papermaking.

(57) In a papermaking operation which utilizes secondary fiber furnish containing hot melt or pressure sensitive adhesive contaminants, a method of inhibiting stickies comprises adding to the pulp slurry at least one surfactant in addition to a hydrocarbon solvent.

Figure 1



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The present invention relates to the us of secondary fiber in th papermaking industry. Mor particularly it is directed toward the reduction of stickies contamination especially that resulting from the use of recycled paper.

The papermaking industry utilizes various amounts of recycled fiber or papers as a source of pap r fiber furnish in the production of finished paper products. These recycled papers are often contaminated with pressure sensitive or hot melt adhesive tapes, seam bindings, labels, decals, stamps and stickers (e.g., bumper). These adhesives are referred to as stickies in the papermaking art.

Stickies are a diverse mixture of synthetic polymeric organic materials which are generally found in the application of recycled fiber papermaking processes. Stickies are relatively larger particles with a size in the range of several microns to several hundred microns. Pitch is a natural resinous substance which consists of resin/fatty acids and exists in the virgin fibers. White pitch occurs in paper mill recycling systems using broke with a latex coating binder. The size of pitch or white pitch is very small, and usually appears as colloidal particles.

During the pulping process, stickies are liberated from recycled fibers due to mechanical and thermal energy. For recycled fiber furnishes which contain a large quantity of plastic tapes, such as old corrugated containers, a significant amount of stickies are released during pulping. These stickies will not disperse well in the water and will either ultimately end up as "dirt spots" on the paper sheets or stick onto the wires, felts or other equipment requiring shutting down the manufacturing equipment in order to remove the stickies by solvent washing techniques.

According to the criteria developed by M. Doshi of Doshi & Associates, stickies can be classified on the basis of size:

Large, retained on 35 mesh screen,	> 0.42 mm
Medium, retained on 200 mesh screen,	0.074 - 0.42 mm
Small, passed through 200 mesh screen,	< 0.074 mm

Large stickies are relatively easily removed by cleaning and screening and therefore do not pose significant problems. Stickies with small size are generally less of a problem as long as they remain stable in the stock. Medium stickies are more likely to be a problem because they cannot efficiently be removed from the stock by a mechanical cleaning system. These stickies have a tendency to agglomerate and cause wire deposition or are a detriment to product quality.

Several non-chemical approaches which have been used in the paper industry to combat stickies include furnish selection, screening and cleaning, and thermal/mechanical dispersion units. Each of these approaches has limitations. Furnish selection may reduce but not completely eliminate the stickie contaminants in the system. It also increases the production cost significantly. Stickies cannot be completely removed with mechanical cleaning equipment since minimum slot size is limited to 0.15 mm for manufacturing reasons. Thermal/mechanical dispersion units can enhance breakup of stickies, but cannot prevent the agglomeration downstream, where problems usually occur. In addition, this approach requires capital investment and energy expenditure.

Chemical treatment can considerably reduce or alleviate stickies problems at a lower cost although its application technology may prove slightly complicated. Current chemical treatment techniques for stickies removal/control include detackification (passivation), dispersion, wire treatment (electrochemical control), maximization of solids retention, and chemical enhanced stickies removal during mechanical cleaning.

Conventional treatment programs directed toward a reduction in stickies related contamination in papermaking operations deal with either detackifying or tying up the suspended stickies particles. US-A- 4 886 575 is an example of one such programme. It discloses adding a polymer of polyvinyl alcohol to the pulp slurry to either reduce the adhesion of stickies particles onto the paper making equipment or prevent them from adhering to the finished paper product.

In a related patent, US-A- 4 923 566, a similar process is taught. Here, urea is added to the pulp slurry for the purpose of pacifying the suspended stickies particles.

It is often desirable to leave adhesive material with the plastic backing/facestock where it can be removed from the system instead of remaining with the paper fibers. In order to make adhesive material remain with the plastic backing/facestock, the adhesive-fiber bonding must be significantly reduced. The reduction of adhesive-fib r bonding str ngth allows the adhesive mat rial to be asily released from th fiber wh n applying the mechanical/thermal nergy. A lower level of adhesive loss from the plastic backing/facestock indicates that l ss adhesive would be pr sent in the fiber slurry as the adhesive would be removed with the plastic backing/facestock via cleaners. This results in a significant reduction of

fiber/adhesiv agglomeration due to the lower levels of stickies contamination. Improved cleaning effici ncy results in increasing fiber yi ld. Meanwhile, pulping difficulties are also reduced.

Since mechanical cleaning systems are not 100% effectiv , those stickies which are liberated from the fiber and plastic backing/facestock cannot be removed completely. Th y behave like fre hydrophobic particles in the fiber slurry. Due to characteristics such as tackiness, deformability, hydrophobicity, etc., these stickies particles have a tendency to agglomerate and deposit on wires or felts and detrimentally affect product quality. Therefore, it is important to prevent them from agglomerating or to further break them down into smaller particles downstream. This can be done by adding a proper type of surface-active agent.

It has been discovered that the addition of specific blends of surfactants and solvents to the pulper in a papermaking operation utilizing secondary fiber inhibits stickies contamination by significantly reducing the amount of stickies liberated from the furnish into the aqueous pulp slurry and preventing the re-agglomeration of those particles remaining in the aqueous slurry.

According to the present invention there is provided a method of inhibiting stickies contamination in a papermaking operation using secondary fiber furnish which contains pressure sensitive or hot melt adhesives, which comprises adding to the aqueous pulp slurry a stickies inhibitor comprising a blend of at least one surfactant and a hydrocarbon solvent to reduce the amount of stickies liberated from the furnish into the aqueous pulp slurry.

The preferred surfactants are selected from fatty alkanolamides and ethoxylated compounds. Representative fatty alkanolamides include oleic diethanolamide (such as that sold under the Trade Name Varamide A7, Sherex), coco-N,N-bis(hydroxyethyl) amide (such as that sold under the Trade Name Varamide A10, Sherex) and coconut diethanolamide (such as that sold under the Trade Name Alkamide CDO, Rhone-Poulenc). Represenstative ethoxylated compounds include ethoxylated alkylphenols, such as, for example alkylphenol ethoxylate (such as that sold under the Trade Name Surfonic N-95, Texaco); coconut amine ethoxylate (such as that sold under the Trade Name Varonic K-205, Sherex), tallow amine ethoxylate (such as that sold under the Trade Name Varonic T-205, Sherex) and fatty alcohol ethoxylate (such as that sold under the Trade Name Alfonic 14-12-60 Vista).

The preferred hydrocarbon solvent selected from terpenes and aliphatic hydrocarbons. Exemplary terpenes include orange terpene (such as that sold under the Trade Name Na 1100 Orange Terpene, Intercit, Inc.) and d-limonene (such as that sold under the Trade Name citrus d-Limonene, Golden Gem Growers, Inc.). A characteristic aliphatic hydrocarbon may be acquired from Ashland Chemicals as 140 Solvent.

For the best results, the stickies inhibitor of the present invention is added to the repulping or papermaking system at a location that will allow intimate contact between the treatment and the contaminated paper stock for a period of time sufficient to permit the inhibitor to perform its function. The amount of stickies inhibitor added to the pulp slurry should be sufficient to allow for subsequent dilution. A concentration of about 1 to 200 ppm is preferably maintained in the repulper or on the paper machine at the point where stickies deposit control is desired.

The amount of individual chemical components of the stickies inhibitor may vary depending upon the amount and chemical makeup of the stickies present. Generally, the stickies inhibitor will contain from about 5 to 95% by weight of the surfactant and from about 5 to 95% solvent. More preferably, surfactant content will be in the range of about 50 to 90% by weight, and solvent content will be about 10 to 50% by weight.

In order to determine the efficacy of the stickies inhibitor according to the present invention, a test using adhesive tape was devised.

The invention is further described, by way of example, with reference to the accompanying drawings, in which:-

Fig. 1 represents the amount of stickies liberated from adhesive tape in pulp slurries both with and without the treatment program of the present invention; and

Fig. 2 shows how the invention reduces stickies present in the slurry via dispersion.

The following results demonstrate the effectiveness of the surfactant/solvent composition on the reduction of adhesive material liberated from tape backing as well as on the dispersion of stickies in the pulp. An adhesive tape was placed on the surface of a paper and pressed at 138 kPa (20 psi) to ensure even adhesion. The paper furnish was treated with various products under the following pulping condition: 4% consistency, 60°C (140°F), pH 7.0, 60 minutes pulping time, and 500 rpm pulper speed. After repulping, all of the plastic backing was collected, rinsed with D.I. water, and dried in an oven at 49°C (120°F) for 24 hours. The percent loss of adhesiv from the plastic backing was determined and the results are shown in Fig. 1. Th results showed that furnish treated with formulations A, B, and C (Table 1) always provid d lower levels (< 2%) of adhesive released from the plastic backing compar d to that of untr ated (10.67%). Under th tested conditions, one percent of adhesive loss was equivalent to 1.875g stickies per

kg. of paper (3.75 lbs. sticki s per ton of paper). A lower level of adhesive loss from the plastic backing indicated that less adhesive would be present in the fiber slurry as the adhesive would b removed with the plastic backing via cleaners.

TABLE 1

List of Formulations		
Formulation	Composition (By Weight)	
A	Alkamide CDO Surfonic N-95 Orange Terpenes	70% 10% 20%
B	Alkamide CDO Surfonic N-95 140 Solvent	70% 10% 20%
C	Varamide A7 Varmide A10 Orange Terpenes	35% 35% 30%

The effect of these formulations on the relative reduction of stickies was studied using the laboratory pulper dispersion test. Ethylene copolymerized with Vinyl Acetate (EVA) was chosen in this work to represent hot melts. A sample of EVA stickies (retained on 50 mesh) equivalent to 10 lb/T was added directly to the laboratory pulper. The selected chemical treatment was added, and the slurry was repulped at 5% consistency for one hour at 1000 rpm and 150°F. The results are shown in Fig. 2. It is clear that all formulations were effective for the reduction of EVA stickies via dispersion.

Claims

1. A method of inhibiting stickies contamination in a papermaking operation using secondary fiber furnish which contains pressure sensitive or hot melt adhesives, which comprises adding to the aqueous pulp slurry a stickies inhibitor comprising a blend of at least one surfactant and a hydrocarbon solvent to reduce the amount of stickies liberated from the furnish into the aqueous pulp slurry.

2. A method according to claim 1, wherein the surfactant is selected from a fatty alkanolamide and an ethoxylated compound.

3. A method according to claim 2, wherein the fatty alkanolamide is selected from oleic diethanolamide, coco-N, N-bis(hydroxyethyl) amide and coconut diethanolamide.

4. A method according to claim 2, wherein the ethoxylated compound is selected from alkylphenol ethoxylate, coconut amine ethoxylate, tallow amine ethoxylate and fatty alcohol ethoxylate.

5. A method according to any of claims 1 to 4, wherein the hydrocarbon solvent is selected from an aliphatic hydrocarbon and a terpene.

6. A method according to any of claims 1 to 5, wherein the amount of stickies inhibitor added to the pulp slurry is sufficient to maintain a concentration of about 1 to 200 ppm.

7. A method according to any of claims 1 to 6, wherein the stickies inhibitor contains from about 5 to 95% by weight of the at least one surfactant and from about 5 to 95% by weight of the solvent.

8. A method according to claim 7, wherein the stickies inhibitor contains from about 50 to 90% by weight of th at least on surfactant and from about 10 to 50% by weight of th solvent.

Figure 1

AMOUNT OF STICKIES LIBERATED FROM ADHESIVE TAPE

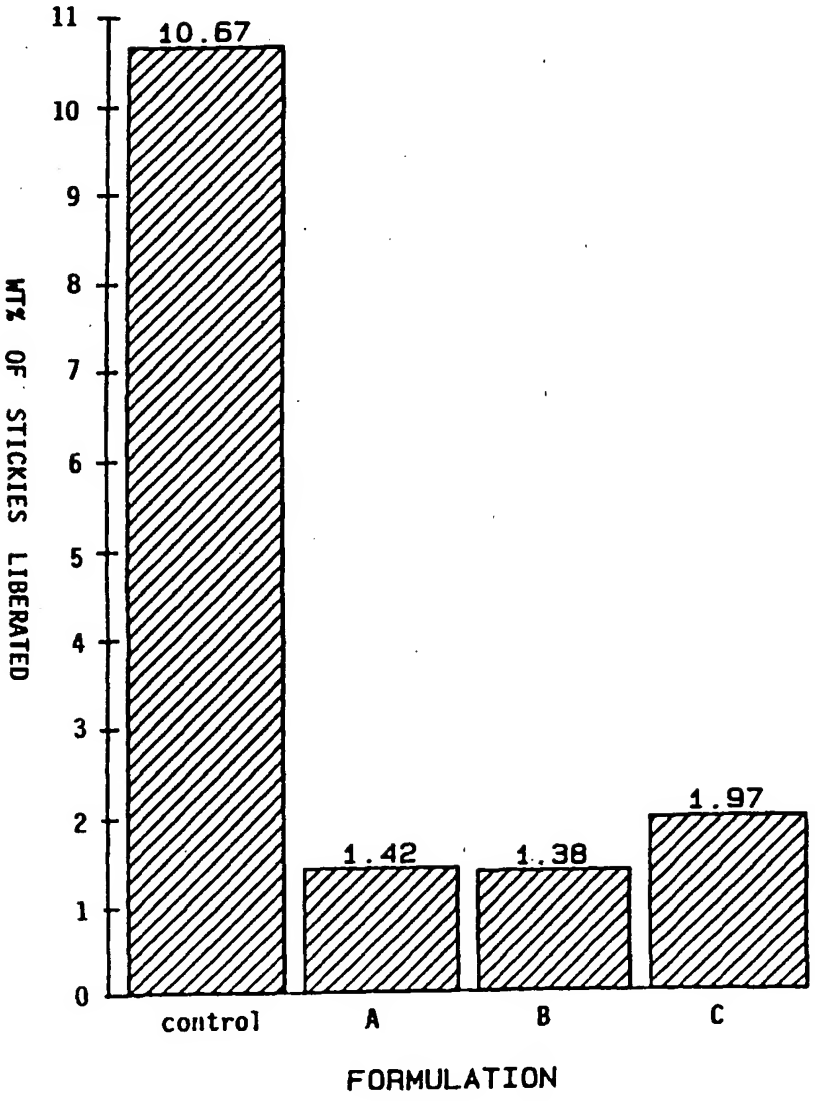
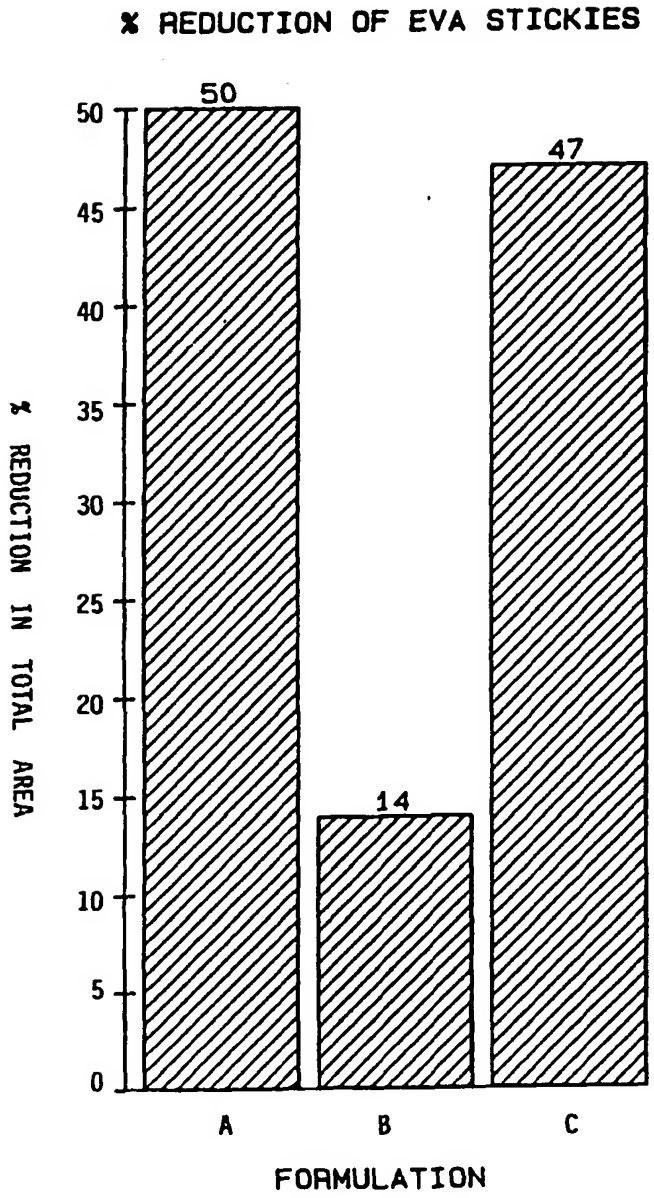


Figure 2


% REDUCTION OF EVA STICKIES
% REDUCTION IN TOTAL AREA
50
47
14
0
5
10
15
20
25
30
35
40
45
50
A
B
C
FORMULATION

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 92 30 3611

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
P,X	WORLD PATENTS INDEX LATEST Week 9138, Derwent Publications Ltd., London, GB; AN 91-278451 & JP-A-3 185 190 (KANZAKI PAPER MFG KK) 13 August 1991 * abstract *	1,5	D21C5/02 D21H21/02
Y	WORLD PATENTS INDEX LATEST Week 8650, Derwent Publications Ltd., London, GB; AN 86-328971 & JP-A-61 245 391 (KATAYAMA KAGAKU KOG) 31 October 1986	1,2	
A	* abstract *	4,5	
Y	EP-A-0 171 370 (BEROL KEMI AB) * page 4, line 27 - page 5, line 4; examples 2-12 *	1,2	
A	WO-A-9 004 674 (MIRANOL INC.) * page 7, line 14 - line 31 *	1,2,5,7	TECHNICAL FIELDS SEARCHED (Int. Cl.5) D21C D21H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	23 SEPTEMBER 1992	BERNARDO NORIEGA F.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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